(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 236 927 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.09.2002 Bulletin 2002/36

(51) Int Cl.7: F16F 13/10

(21) Application number: 02001683.8

(22) Date of filing: 24.01.2002

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 02.03.2001 JP 2001058756

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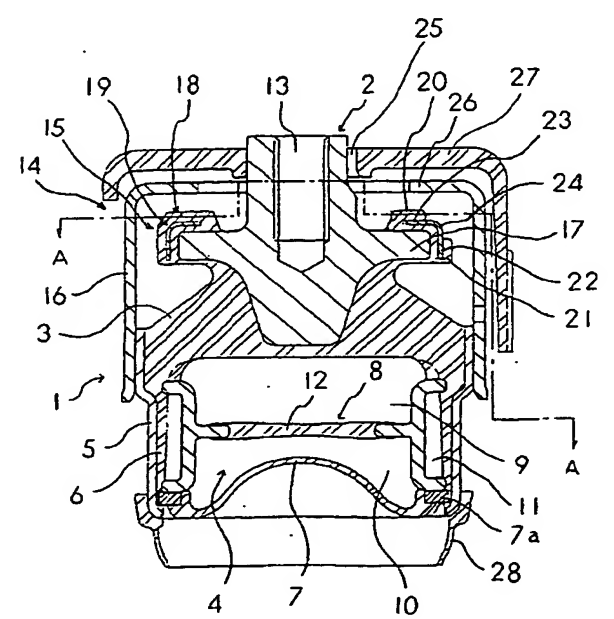
(54) Engine mount

(57) An engine mount having a vibration isolating base body formed of a rubber elastic body (3) interposed between a body side metal fitting (1) and an engine side metal fitting (2). A stopper mechanism which absorbs an excessive displacement of an engine mount is provided. The stopper mechanism is constituted of a cylindrical metal fitting (16) provided at said body side metal fitting and a stopper rubber portion (15) provided at said engine side metal fitting opposed to the cylindrical metal fitting. Said stopper rubber portion is constituted of an outer peripheral flange (17) protruding radially outwardly from the engine side metal fitting, a coating rubber layer (18) covering said outer peripheral flange and a reinforcing metal fitting of a L-shape cross section (19) embedded in said coating rubber layer.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an engine mount used for supporting an automobile engine and the like on a vehicle body.

[0002] In general, when an automobile engine and the like is installed on a vehicle body, engine mounts are interposed therebetween in order to control vibration transmission from an engine to a vehicle body. One prior art example of an engine mount is shown in Fig. 3. Said engine mount comprises a body side metal fitting 101 fixed to a vehicle body, an engine side metal fitting 102 fixed to an engine, a vibration isolating base body 103 formed of a rubber elastic body interposed between both of the metal fittings 101 and 102, and a liquid chamber 107 partitioned into a main chamber 105 and an auxiliary chamber 106 by a partition member 104, whereby the vibration damping function and the vibration isolating function are achieved by the operation of the vibration isolating base body 103 and a liquid flow effect through an orifice 108 provided at the partition member.

[0003] Further, a stopper mechanism 109 is provided in order to prevent a large displacement of the engine mount caused by vibration of an engine and the like. Namely, an outer peripheral flange 110 of the engine side metal fitting 102 is covered by a coating rubber layer 111 so as to form a stopper rubber portion 112. The cylindrical body side metal fitting 101 is provided with a cylindrical portion 113 extending to the engine side so as to oppose the stopper rubber portion 112 and with an inner peripheral flange 114 formed radially inwardly from the cylindrical portion 113. By maintaining a given clearance between both of the above mentioned cylindrical portion 113 and the inner peripheral flange 114 and the stopper rubber portion 112, an excessive displacement of the engine mount, which occurs for example during the vehicle running on a bad road, is absorbed.

[0004] In the above stopper mechanism, however, the coating rubber layer of the stopper rubber portion is made of a comparatively soft rubber elastic composition. Accordingly, in case continuously repeated vibration is exerted on the stopper mechanism during the vehicle running on a bad road for a long period, the stress is likely to concentrate on a boundary portion between the soft coating rubber layer and the outer peripheral flange covered thereby, which results in the occurrence of cracks of the coating rubber layer.

[0005] In order to solve the above problem, it may be proposed to enhance the rigidity of the coating rubber layer by increasing a spring constant of the coating rubber layer. However, in view of the fact that said coating rubber layer is formed integrally with the vibration isolating base body, such solution affects the spring constant of the vibration isolating base body, namely, the properties of the engine mount. Alternatively, a different component having a high rigidity may be applied in place of the coating rubber layer. However, such alternate component leads to increasing of material costs and production costs.

SUMMARY OF THE INVENTION

[0006] In view of the above, it is an object of the present invention to provide an engine mount wherein the durability of the stopper rubber portion is improved without affecting the spring properties of the vibration isolating base body.

[0007] It is another object of the present invention to provide an engine mount having a low-cost stopper rubber portion having high durability.

[0008] The inventors have made various studies with respect to an engine mount which can improve durability of the stopper rubber portion without affecting the spring properties of the vibration isolating base body and as a result, it has been found that a low-cost stopper rubber portion having a high rigidity can be obtained without affecting the spring properties of the vibration isolating base body provided that a reinforcing metal fitting is embedded in the coating rubber layer to enhance the rigidity thereof.

[0009] According to the present invention, a stopper mechanism which absorbs an excessive displacement of an engine mount comprises a cylindrical metal fitting provided at a body side metal fitting surrounding a engine side metal fitting and a stopper rubber portion protruding from the engine side metal fitting so as to oppose to said cylindrical metal fitting, and said stopper rubber portion is comprised of an outer peripheral flange protruding radially outwardly from the engine side metal fitting, a coating rubber layer covering said outer peripheral flange, and a reinforcing metal fitting embedded in said coating rubber layer.

[0010] Namely, the present invention provides a engine mount having a vibration isolating base body formed of a rubber elastic body interposed between a body side metal fitting and an engine side metal fitting, wherein said body side metal fitting being provided with a cylindrical metal fitting surrounding an engine side metal fitting, said engine side metal fitting being provided with a stopper rubber portion opposed to said cylindrical metal fitting, said stopper rubber portion comprising an outer peripheral flange protruding radially outwardly from said engine side metal fitting, a coating rubber layer covering said outer peripheral flange and a reinforcing metal fitting embedded in said coating rubber layer.

[0011] Such reinforcing metal fitting may be embedded in the coating rubber layer in a integral molding process of the coating rubber layer and the vibration isolating base body without taking a separate molding process, and so the production costs bear comparison with the case of manufacturing an engine mount having no such reinforcing metal fitting. The material cost of the reinforcing metal fitting is cheaper as compared with a

different component having a high rigidity to be applied in place of the coating rubber layer.

[0012] Said reinforcing metal fitting may be embedded in any position of the coating rubber layer in order to increase a rigidity of the coating rubber layer. For example, said reinforcing metal fitting may be embedded at a position where vibration is so often received repeatedly, that is, a position opposed to an inner peripheral face of the cylindrical metal fitting or a position opposed to an inner peripheral flange formed radially inwardly from the cylindrical metal fitting. Preferably, said reinforcing metal fitting is embedded in both of the above mentioned positions, namely, the position opposed to an inner peripheral face of the cylindrical metal fitting and the position opposed to an inner peripheral flange.

[0013] Accordingly, the present invention also provides a engine mount comprising a body side metal fitting, an engine side metal fitting and a vibration absorbing base body formed of a rubber elastic body interposed therebetween, a cylindrical metal fitting provided at said body side metal fitting surrounding said engine side metal fitting, an inner peripheral flange extending radially inwardly from said cylindrical metal fitting, a stopper rubber portion protruding from said engine side metal fitting opposed to both the cylindrical metal fitting and the inner peripheral flange, said stopper rubber portion comprising a outer peripheral flange extending radially outwardly from the engine side metal fitting, a coating rubber layer covering said outer peripheral flange and a reinforcing metal fitting embedded in the coating rubber layer, said reinforcing metal fitting being embedded in both a position opposed to the inner peripheral face of the cylindrical metal fitting and a position opposed to the inner peripheral flange respectively.

[0014] The reinforcing metal fittings embedded in both positions may be formed as a single unit. Namely, a reinforcing metal fitting may be formed in a L-shape cross section having a radial reinforcing portion opposed to the inner peripheral face of the cylindrical metal fitting and an axial reinforcing portion opposed to the inner peripheral flange. Such reinforcing metal fitting is easily embedded in a vulcanization-molding process of the coating rubber layer and besides a corner portion of the L-shape reinforcing metal fitting prevents the stress concentration subjected to an outer peripheral edge portion of the outer peripheral flange, so that the rigidity of the stopper rubber portion is well enhanced.

[0015] The reinforcing metal fitting is preferred to be disposed in a ring-like configuration all round the stopper rubber portion. As an alternate, however, a reinforcing metal fitting may be disposed only at a position where vibration is so often received repeatedly, or a plurality of reinforcing metal fittings may be disposed discontinuously all round the stopper rubber portion.

[0016] The above mentioned stopper mechanism is applicable to both an engine mount having no liquid chamber and a liquid filled engine mount having a liquid chamber comprising a main liquid chamber and an auxiliary liquid chamber. When applied to a liquid filled engine mount, the functionality and durability of the stopper rubber portion can be improved without affecting the properties of the vibration isolating base body which actuates a filled liquid by piston action.

[0017] As mentioned above, in the engine mount in accordance with the present invention, a low-cost stopper rubber portion of high rigidity is obtained by embedding the reinforcing metal fitting in the stopper rubber portion without affecting the properties of the engine mount. Even when continuously repeated vibration is exerted on the stopper mechanism during the vehicle running on a bad road for a long period, no failure occurs on the stopper rubber portion and the durability is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a longitudinal sectional view of an engine mount according to the present invention;
Fig. 2 is a sectional view taken along the line A-A of Fig. 1; and
Fig. 3 is a longitudinal sectional view of a conventional engine mount.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Preferred embodiments of the present invention will be explained in detail below with reference to the accompanying drawings.

[0020] The engine mount shown in Fig. 1 and Fig. 2 comprises a body side metal fitting 1 mounted on a vehicle body, an engine side metal fitting 2 mounted on an engine, a vibration isolating base body 3 formed of a rubber elastic body interposed between the body side metal fitting 1 and the engine side metal fitting 2, and a liquid filled chamber 4.

[0021] The body side metal fitting 1 is constituted of a metal cylinder 5 and a cylindrical metal fitting 16. The vibration isolating base body 3 and a rubber layer 6 continuously formed of the lower end portion of the vibration isolating base body are bonded to the inner peripheral face of the metal cylinder 5 by vulcanization adhesion. A lower opening end portion of the metal cylinder 5 and the vibration isolating base body 3 is sealed with a diaphragm 7, and a liquid chamber 4 is formed by a space surrounded by the vibration isolating base body 3, the diaphragm 7 and the metal cylinder 5. The liquid chamber 4 is partitioned into an upper main liquid chamber 9 and a lower auxiliary liquid chamber 10 by a partition member 8 provided in the liquid chamber in a pressed condition against the rubber layer 6, and the two liquid chambers 9 and 10 are communicated with each other by an orifice 11 provided at the outer periphery of the partition member 8. Consequently, a low frequency vi-

bration is damped by the liquid flow effect through the orifice 11 actuated by piston action of the vibration isolating base body 3 at the time when a vibration is exerted. A rubber membrane 12 is provided at a central portion of the partition member 8 by vulcanization adhesion, and said rubber membrane absorbs a high frequency vibration which can not be absorbed by the liquid flow effect through the orifice 11.

[0022] The partition member 8 and the diaphragm 7 are disposed at the body side metal fitting 1 in such a manner that they are inserted into the metal cylinder 5 and thereafter the metal cylinder 5 is reduced in size in the radial direction to fix a ring-like metal fitting 7a of the diaphragm 7 not so as to drop out of the metal cylinder. The body side metal fitting 1 is fixed to a frame and the like of the vehicle body using a mounting metal fitting, not illustrated, welded to the cylindrical metal fitting 16. The engine side metal fitting 2 made of a bar-like metal member positioned to the center portion of the body side metal fitting 1 is provided with a bolt hole 13 at the axially upper end for fastening thereto an mounting bolt of an engine and provided with the vibration isolating base body 3 at the lower end formed integrally by vulcanization adhesion.

[0023] The vibration isolating base body 3 is of substantially a conical shape integrally formed in a vulcanization molding with the inner peripheral face of the upper portion of the metal cylinder 5 of the body side metal fitting 1 and the lower end portion of the engine side metal fitting 2, and performs the vibration damping function and the pistion action function for actuating the flow of the liquid filled in the liquid chambers.

[0024] At the upper portion of the engine side metal fitting 2, a stopper mechanism 14 which absorbs an excessive displacement of an engine mount is provided. The stopper mechanism 14 is constituted of a stopper rubber portion 15 projecting radially outwardly from the engine side metal fitting 2 and the cylindrical metal fitting 16 of the engine side metal fitting 1 surrounding the stopper rubber portion 15. The stopper rubber portion 15 is constituted of an outer peripheral flange 17 projecting radially outwardly from the engine side metal fitting 2, a coating rubber layer 18 covering said outer peripheral flange 17, and a reinforcing metal fitting 19 embedded in said coating rubber layer 18.

[0025] The coating rubber layer 18 is formed integrally with the rubber elastic body constituting the vibration isolating base body 3. For obtaining an effective stopper function, a thick rubber layers 20 and 21 are formed respectively at the upper periphery and the radially outward periphery of the outer peripheral flange 17.

[0026] The reinforcing metal fitting 19 is made of a metal plate formed in a ring-like shape surrounding the outer peripheral flange 17, and constituted of a radial reinforcing portion 22 positioned radially outwardly from the outer peripheral flange 17 and an axial reinforcing portion 23 positioned axially outwardly from the outer peripheral flange 17. Said reinforcing portions are formed as a single unit in a L-shape cross section to form the reinforcing metal fitting of an inverted cup shape. Each of the reinforcing portions 22 and 23 is embedded in the center portion of the coating rubber layer 18.

[0027] At plural positions, four positions in this embodiment, of the outer periphery of the coating rubber layer 18 to be embedded therein the reinforcing metal fitting 19, an aperture 24 is provided to expose a corner portion of the reinforcing metal fitting 19 outside of the coating rubber layer 18, so that the reinforcing metal fitting 19 is hold at the exposed corner portion in the vulcanizing mold process of the coating rubber layer 18 and the reinforcing metal fitting 19 embedded therein.

[0028] The cylindrical metal fitting 16 is formed in an inverted cup shape by bending the upper portion radially inwardly to form an innner peripheral flange 26 opposed to the upper portion of the stopper rubber portion 15 and provided with an opening 25 at the center portion thereof which permits a radial movement of the engine side metal fitting 2 of a bar-like member. The lower opening of the cylindrical metal fitting 16 is press-fitted and fixed to the outer periphery of the metal cylinder 5 to form the engine side metal fitting 1. The cylindrical metal fitting 16 may be formed integrally with the metal cylinder 5 so as to form the body side metal fitting 1.

[0029] At the upper end portion of the engine side metal fitting 2, a stopper and covering member 27 is provided, so that a large displacement in the downward direction of the engine side metal fitting 2 is suppressed with the elastic contact of the stopper member with the inner flange 26 of the cylindrical metal fitting 16. At the outer periphery of the lower end portion of the body side metal fitting 1, a dust cover 28 having substantially a cylindrical shape is provided.

[0030] In the above mentioned constitution, in case either the body side metal fitting 1 or the engine side metal fitting 2 is displaced excessively during the vehicle running on a bad road, the stopper rubber portion 15 is brought into contact elastically with the inner periphery of the cylindrical metal fitting 16 or with the inner peripheral flange 26 so as to suppress further deflective deformation.

[0031] As the reinforcing metal fitting 19 comprising the axial reinforcing portion 23 and the radial reinforcing portion 22 is embedded in the coating rubber layer 18 covering the stopper rubber portion 15, the rigidity of the coating rubber layer 18 is high enough to suppress the deflective deformation without causing the destruction of the coating rubber layer, even when the engine mount is subjected to a repeated load or vibration exerted in the axial direction or in the radial direction. Accordingly, the vibration isolating base body 3 made of rubber elastic body maintaining given spring properties is improved in the functionality and durability.

[0032] It should be understood that the foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those

skilled in the art without departing from the invention. For example, the cylindrical metal fitting of an inverted cup shape may be formed in a simple cylindrical shape without forming the inner peripheral flange and the reinforcing metal fitting embedded in the stopper rubber portion may be constituted only of a radial reinforcing portion, when the axial displacement hardly occurs.

Claims

1. An engine mount comprising a vibration isolating base body formed of a rubber elastic body interposed between a body side metal fitting and an engine side metal fitting, a cylindrical metal fitting provided at said body side metal fitting surrounding said engine side metal fitting, and a stopper rubber portion provided at said engine side metal fitting opposed to said cylindrical metal fitting, said stopper rubber portion comprising an outer peripheral flange protruding radially outwardly from said engine side metal fitting, a coating rubber layer covering said outer peripheral flange and a reinforcing metal fitting embedded in said coating rubber layer.

2. An engine mount comprising a vibration isolating base body formed of a rubber elastic body interposed between a body side metal fitting and an engine side metal fitting, a cylindrical metal fitting provided at said body side metal fitting surrounding said engine side metal fitting, an inner peripheral flange extending radially inwardly from said cylindrical metal fitting, a stopper rubber portion protruding from said engine side metal fitting opposed to both the cylindrical metal fitting and the inner peripheral flange, said stopper rubber portion comprising an outer peripheral flange extending radially outwardly from the engine side metal fitting, a coating rubber layer covering said outer peripheral flange and a reinforcing metal fitting embedded in said coating rubber layer, said reinforcing metal fitting being embedded in both of a position opposed to the inner peripheral face of the cylindrical metal fitting and a position opposed to the inner peripheral flange respectively.

3. An engine mount as claimed in Claim 2, wherein the reinforcing metal fitting is formed as a single unit in a L-shape cross section having a radial reinforcing portion opposed to the inner peripheral face of the cylindrical metal fitting and an axial reinforcing portion opposed to the inner peripheral flange.

4. An engine mount as claimed in Claim 1, wherein the engine mount is of a liquid filled type providing with a liquid chamber comprising a main liquid chamber and an auxiliary liquid chamber.

5. An engine mount as claimed in Claim 2, wherein the engine mount is of a liquid filled type providing with a liquid chamber comprising a main liquid chamber and an auxiliary liquid chamber.

6. An engine mount as claimed in Claim 3, wherein the engine mount is of a liquid filled type providing with a liquid chamber comprising a main liquid chamber and an auxiliary liquid chamber.

FIG. 1

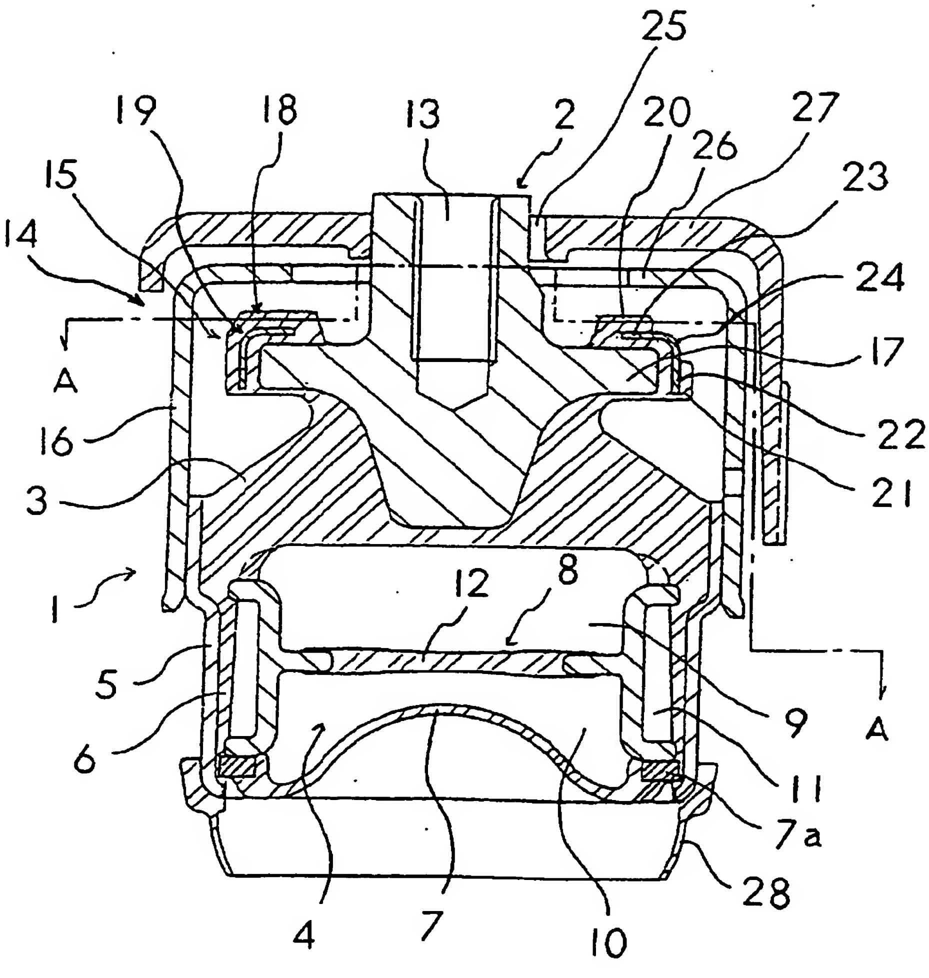
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FIG. 2

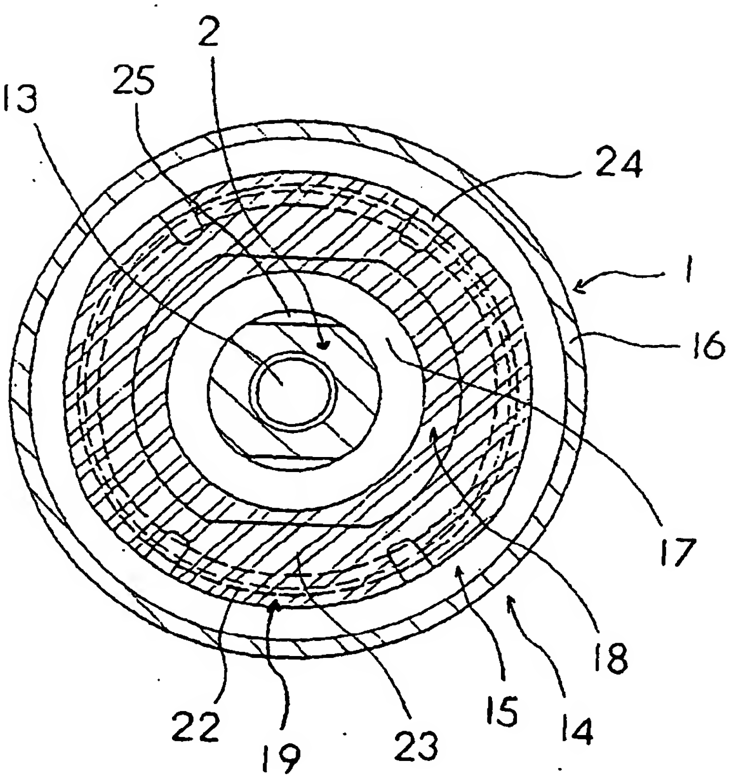

FIG. 3